EYE ACTUATED SLEEP PREVENTION DEVICES AND OTHER EYE CONTROLLED DEVICES

BRIEF SUMMARY OF THE INVENTION

This invention is an eyeglass attachable device for automobile and truck drivers for an alertness alarm signal and usable also for various additional applications, like controlling the steering wheel movements of a vehicle, a car, a truck or a motorized wheelchair, by means of blinking the the eyes.

This eyeglass attachable alarm signal device prevents automobile and truck drivers from falling asleep, while driving. A beam of a narrow band infrared light or a beam of ultrasound is used for sensing, whether the driver's eyelids are closed or are in an open position.

A tiny adjustable infrared light emitter carrier, sliding along one of the eyeglasses temples, is used for positioning the light emitter on the eyeglasses temple just right for each driver.

For alerting a drowsy driver, whose eyes have been closed for a longer time period than about one second, an electronic circuitry is activated by means of the closed eye signal from the two parallel-coupled infrared light detectors, turning on an alarm signal from a buzzer or similar, after an one second or shorter time delay.

Electronically finding out the right infrared light beam, which is closest passing the eyeball, is done by means of analyzing the eye-wetting blinks presence in a number of infrared light beams. A normal eye-wetting blink of the eye don't trigger the alarm signal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows the approximate positions of the infrared light emitter and the two infrared light detectors in relation to the driver's eye.

FIG. **2** is a view of the driver's eye and the positions of the infrared light emitter and of the two infrared light detectors and driver's eyelids, when the drivers eyes are open and the driver is looking forward, as he is doing, while driving.

FIG. **3** is a view of the driver's eye and positions of the infrared light emitter, two infrared light detectors and the position of the driver's eyelids, when the driver is briefly looking downward while driving the car.

FIG. **4** is a cross section of the light emitter, one of the light detectors and of the drivers eye, when the driver's eyes are open.

FIG. **5** is a vertical cross-sectional view of the driver's eye, showing the approximate position where both light beams **11** and **14** are passing the eye when the car driver's eyes are open.

FIG. **6** is a horizontal cross-sectional view of the driver's eye, when the eyes of the driver are closed. This view shows how the upper eyelid prevents the light from the emitter reaching the light detector.

FIG. **7** is a perspective view of the sleep-preventing alarm device, in which it is used an infrared emitter and two infrared detectors, attached to a pair of regular eyeglasses, which have a heat-reflective coating on their surface and a shield behind the emitter-side of the eyeglasses, to prevent the bright daylight and the sunshine from interfering with operation of this device during daytime driving.

FIG. **8** shows the electronic circuitry for this sleep-preventing device, consisting of an infrared emitter, two infrared detectors, and a RC circuitry for delaying the onset of the audible alarm and employing two NPN transistors in a Darlington coupling for activating the audible alarm buzzer.

FIG. **9** is a perspective view of the sleep-preventing alarm device, attached to a pair of regular eyeglasses, which is using an ultrasonic transducer/transmitter and an ultrasonic transducer/receiver for analyzing the eye movements of a car driver.

FIG. **10** shows the frequency generator for the ultrasonic transducer/transmitter.

FIG. **11** shows the electronic circuitry for this sleep-preventing device, which is using ultrasonic transducers for analyzing the eye movements of a car driver.

FIG. **12** is a perspective view of a sleep-preventing device, attached to a pair of regular eyeglasses, on the left temple of which is mounted a servomotor and a servomotor controlled sliding block, carrying three photodetectors, which are used for automatic positional adjustment of the eye movements analyzing infrared photodetector **5**.

FIG. **13** is a horizontal cross section of the three photocells carrying a sliding block, showing the driver's eye position relative to the infrared light beam, which is going from the emitter **4** to the infrared light detector **5**, FIG. **13**.

FIG. **14** shows two cylindrical lenses, which are making the sleep preventing device less critical to adjust. It also shows, how these cylindrical lenses are mounted relative to the driver's eye and relative to the infrared light emitter and the infrared light detector.

FIG. **15** is a horizontal cross-sectional view of the driver's eye, the cylindrical lens and the infrared emitter and the infrared detector, showing how the cylindrical lenses are mounted relative to the driver's eye and the infrared light emitter and the infrared light detector.

FIG. **16** shows how two convex lenses are mounted relative to the driver's eye and relative to the infrared light emitter and the infrared light detector.

FIG. **17** is a horizontal cross-sectional view of the driver's eye, the convex lenses and the infrared emitter and the infrared detector, showing how the convex lenses are mounted relative to the driver's eye and the infrared light emitter and the infrared light detector.

FIG. **18** is a perspective view of the sleep-preventing alarm device, attached to a pair of regular eyeglasses according to another embodiment of the present invention, where the emitter is attached to the eyeglasses close to the bridge of the eyeglasses and the light detector is attached to the sliding block, which is movable along the temple of the eyeglasses.

FIG. **19** is showing how a photodetector, according to the present invention, is enclosed in all it's 6 sides by means of infrared filters, for example by means of Eastman Kodak gelatine filter number **87**.

FIG. **20** shows the electronic circuitry for generating pulsed emitter light.

FIG. **21** shows the electronic circuitry for receiving driver's eye analyzing signals by means of pulsed emitter light.

FIG. **22** is a perspective view of the sleep preventing alarm device, attached to a pair of regular eyeglasses, according to the present invention, where a bank of solar cells is attached to one of the eyeglasses temples to power the electronic circuitry.

FIG. **23** is perspective view of an headband onto which is mounted a bank of solar cells to power the electronic circuitry according to the present invention.